Pesticide Drift: Views from Beyond the Fence Line

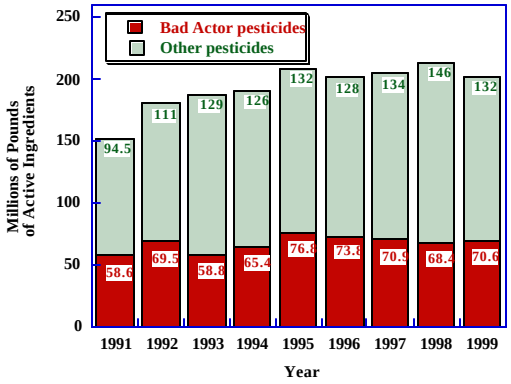
Susan E. Kegley, Ph.D.
Pesticide Action Network
http://www.panna.org
Californians for Pesticide Reform
http://www.igc.org/cpr

Overview

- Is there a problem?
- Pesticide toxicity
- Impacts of drift on communities
- Exposure scenarios
- Inadequacy of risk assessment
- Solutions: regulatory strategies and beyond

Is there a problem?

- 203 million pounds of pesticides reported *used* in CA in 1999.
- 70 million pounds of the 1999 reported total are **Bad Actor pesticides**
  - highly acutely toxic (LD_{50})
  - known or probable carcinogens (EPA or Prop 65)
  - reproductive or developmental toxicants (Prop 65)
  - cholinesterase inhibitors (DPR)
  - known groundwater contaminants (DPR)
- 340 million pounds of pesticides reported *sold* in CA in 1998.
- Pesticide residues found on food, in drinking water, and drifting over the fence from applications near homes.
- Reported farmworker poisonings in CA average 665 cases per year.

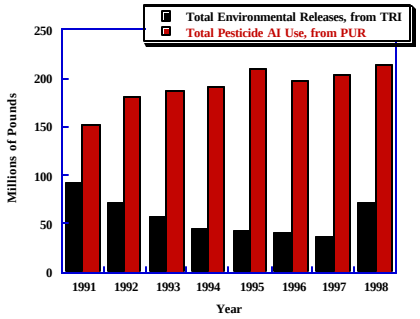


Pesticides are toxic*

- Increased age- and smoking-adjusted incidence of cancers that have been linked to pesticide use
  - Non-Hodgkins lymphoma: 3-4% increase per year, last 25 years
  - Multiple myeloma: 4% increase per year between 1940 and 1980
  - Childhood leukemia: 1-2% per year, last 25 years
  - Astrocytomas (brain tumors): 50-100% increase over last 25 years
- Increased incidence of asthma, allergic reactions and other respiratory problems linked to pesticide use
- Association of pesticide use with Parkinson's Disease, peripheral neuropathy, impaired memory and reaction time.
- Many pesticides are known to cause birth defects, infertility and miscarriages.

*See *Pesticides and Human Health*, www.igc.org/cpr/publications/publications.html#A

Pesticide emissions dwarf manufacturing emissions in California



Impacts of drift

- Farmworkers in adjacent fields
  - Between 1991 and 1996, ~4,000 cases of agricultural pesticide poisoning reported. 44% were caused by drift.
- Neighbors living near fields
- Neighbors living near other neighbors that spray
- Organic farms
  - Denial of certification
  - If residues >5% of tolerance, cannot be labeled organic
  - Disruption of beneficial insect populations
- Wild plants, birds, mammals and other non-target species

A more comprehensive definition of drift

Any pesticide that travels through the air, including spray droplets created during a liquid application, gas-phase chemicals from fumigant applications, airborne dusts or powders, pesticides that volatilize after application, and pesticide-contaminated dust particles.

Exposure (E)

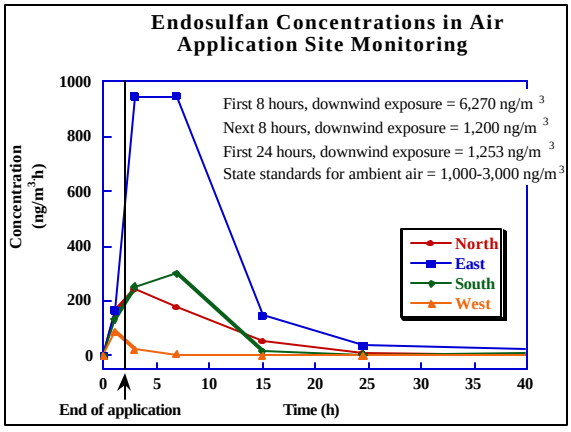
- $E_{total} = E_{oral} + E_{inhalation} + E_{dermal}$
- $E_{inhalation}$ for a neighbor living near an application site is a function of:
  - application technique
  - formulation
  - location-related factors
  - atmospheric factors (wind speed and direction, temperature)
  - **vapor pressure of the pesticide applied**
  - **amount of the pesticide applied**

Exposure data from Toxic Air Contaminants sampling

- Air Resources Board sampling data
  - 893 registered active ingredients in CA
  - DPR has air monitoring data for only ~50 pesticides
  - For volatile pesticides, concentrations in air typically measurable for >48 hours after an application, sometimes longer
  - For volatile pesticides, most of the drift occurs in the 24 hours after the application

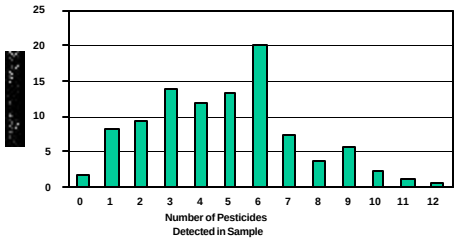
ARB application site monitoring of endosulfan application

- 8.5 acre apple orchard, 6 acres treated
- Thiodan 50 WP, ground-rig blower, 2.5 mph, small nozzle (#3 T-jet), 200 psi, 200 mph fan
- Wind speed 2-8 mph over first 16 h, predominantly from West, but variable; temperature 44-71°F over first 24 h
- XAD resin tubes used for sampling, 4 stations at compass points around the field, 11 yards from field edge
- Average recovery 83% for endosulfan I and 62% for endosulfan II



Pesticide	Vapor Pressure (mm Hg)
1,3-dichloropropene	29
Chloropicrin	23
EPTC	0.029
Cycloate	1.1×10^{-3}
Trifluralin	1.0×10^{-4}
Diazinon	1.3×10^{-4}
Endosulfan	1×10^{-5}
Alachlor	1.4×10^{-5}
Chlorpyrifos	1.7×10^{-5}
Metolachlor	3.1×10^{-5}
Aldicarb	3.5×10^{-5}
Chlorothalonil	2.0×10^{-6}
Acephate	2.7×10^{-7}
Permethrin	2.2×10^{-8}

Lompoc Air Monitoring: Percent of SamplesWith Detected Pesticides



Lompoc: Most Frequently Detected Pesticides

Pesticide	Percent of Samples Detected*
Chlorthal-dimethyl	91
PCNB	72
Vinclozolin	65
Chlorpyrifos	33
Dicloran	28
Trifluralin	24
Malathion	21
Naled	19
Malathion oxon	18
Chlorthalonil	18

*Includes quantified detections and trace detections

Lompoc: Highest 10-week concentrations

Pesticide	Conc. 1998 (ng/m^3)	Conc. 2000 (ng/m^3)	Chronic or Cancer Screening Level (ng/m^3)
PCNB	**Not tested**	**7.2**	**27**
Dicloran	**Not tested**	**2.4**	**42,500**
Chlorthal-dimethyl	**Not tested**	**1.8**	**4,700**
Chlorpyrifos	**83**	**1.7**	**50**
Vinclozolin	**Not tested**	**1.6**	**2,040**
Cycloate	**760**	**1.4**	**8,500**
Malathion	**Not tested**	**1.0**	**4,600**
Dicofol	**Not tested**	**0.8**	**680**
Diazinon	**18**	**0.6**	**95**
EPTC	**Not tested**	**0.5**	**850**
Malathion oxon	**Not tested**	**0.4**	
Fonofos	**ND**	**0.4**	**3,400**

Methyl Bromide: The movie

- Methyl bromide exposures in 1999
  - Methyl bromide use correlated to air monitoring results
  - Use should be below 20,000 lbs per month per township (36 square miles) to keep exposures below acceptable sub-chronic levels

Pesticide use as a proxy for exposure in Earlimart, CA

- 9 townships surrounding Earlimart, a block 18 miles on a side

Application method	Unit of measure	Lbs. AI	% of Total Lbs	No. of Applications
Aerial	AI	512,129	60	6,386
Ground	Gal, Qt, Pt	163,330	19	2,664
Ground	Lbs, Oz	174,108	20	722
Ground, fumigant	Lbs	23,359	2.7	8
Unspecified	Unspec.	3,179	0.3	13
Total	**AI**	**852,746**	**100**	**9,785**

Of the known airborne pesticides used in the 18x18 mile block in 1999

- 189 different chemicals during the year
- 49 are Bad Actor pesticides, 217,230 lbs, 25% of total lbs
- 317 days with pesticide applications; 264 days with Bad Actor pesticide applications
- Average of 29 applications per day; median 17; maximum 223 (March)

Risk Assessment: The plan

- Determine what kinds of harm are caused by a single pesticide
- Determine levels that cause "unreasonable" risk to a population
- Determine exposure pathways
- Estimate exposure from each pathway
- Control risk by controlling exposure
- Control exposure by creating a list of label restrictions

Risk Assessment: The reality

- Harm we don't know about yet doesn't count
- Assumes exposure is to a single pesticide
  - Lompoc air sampling showed an average of 7 pesticides in each sample
- Assumes label instructions effectively control exposures
  - Assumes people read the directions
  - Assumes people follow the directions
  - Assumes people never make mistakes

Lack of information

- Pesticide use patterns
- Health effects
- Exposure assessments
  - inhalation data almost non-existent
  - very little air monitoring data
- Chronic health effects unknown

Why current regulatory approaches don't work

- Technical specifications do not address most drift
- No limits on quantities of pesticides applied
- No buffer zones
- No enforcement, no monitoring

A successful strategy will:

- Deal with **all** types of drift (solids, liquids, fumigants; primary/secondary)
- Focus on the most toxic pesticides first = **Fumigants**
- Reduce pesticide use overall
- Protect the most sensitive populations and sites
- Provide education about least-toxic pest-control methods
- Implement effective buffer zones
- Require advance neighbor notification
- Create enforceable regulations that prevent drift even when there are mistakes and non-compliance

Needed: New regulatory solutions and incentives for change

- **Best:** Phase out use of drift-prone pesticides altogether.
  - Phase in cultural methods that reduce pest outbreaks
  - When controls are necessary, use least-toxic, non-spray controls
    - For insects: pheromones, beneficial insect releases, birds, baits
    - For weeds: tilling, mulching
- **At least:** Eliminate drift-prone applications of the most toxic pesticides and implement substantial buffer zones
- **How can the regulated community and impacted communities contribute?**
  Support greater investment in least-toxic pest-control technologies

Whose risk? Whose benefit?

- Benefits accrue to:
  - pesticide manufacturers
  - growers
  - applicators
  - consumers
- Risks (and costs) belong to:
  - neighbors: health problems
  - organic farms: inability to market produce
  - ecosystems

Monterey County
The Herald
News
TODAY'S HERALD
Published Friday, August 31, 2001

Judge restricts pesticide

By ANNA DAVISON

A Monterey County Superior Court judge took action Thursday to protect children at two county schools from potentially unsafe exposure to the agricultural fumigant methyl bromide.

Judge Robert O'Farrell granted a temporary restraining order that will require the California Department of Pesticide Regulation and the Monterey County agricultural commissioner to further regulate the use of the chemical in the vicinity of Fajaro Middle School in North County and La Joya Elementary School in Salinas. Air quality tests carried out last fall near both schools picked up concentrations of the chemical that exceeded state guidelines.

Continued Drift = Lose/Lose for Everyone

- Neighbors are poisoned
- Farmer/neighbor relations deteriorate
- Ecosystems are damaged
- Citizen assists to enforcement – air monitoring
- The courts step in
- Farmers go out of business
- Farmlands converted into shopping malls and housing developments
- Everybody loses